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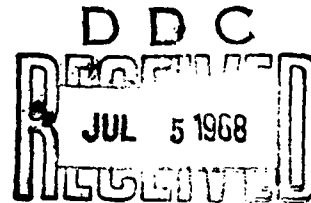
FOREIGN TECHNOLOGY DIVISION



W-3 THE FIRST POLISH SPEED BOAT

by

Adam Bronikowski



GOLDEN ANNIVERSARY

FOREIGN TECHNOLOGY DIVISION

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UNEDITED ROUGH DRAFT TRANSLATION

W-3 THE FIRST POLISH SPEED BOAT

By: Adam Bronikowski

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ABSTRACT: The W-3 hydrofoil, which will initially be put into service between Szczecin and Swinoujscie, is powered by the versatile Soviet-built M-50 F4 engine (see Table 1 of the Enclosure); the author speculates that in the near future such engines will be built in Poland. The vessel's foils are made of 1H 18N9T nickel-chromium alloy which is considered to be highly durable and is one of the best and lightest metals now used in the construction of foils. Total weight of the rudder and the foils with supports is only 2,900 kg. Aluminum is the basic material used in the construction of the craft. The W-3 hydrofoil, which carries 76 passengers, is equipped with unsinkable compartments; even if two compartments are filled with water, the vessel can remain afloat with a full load. Orig. art. has: 2 figures and 1 table. English Translation: 4 pages.

Table 1. Specifications on the W-3 hydrofoil

RPM of Engine	@1625	@1700	@1850
Speed, km/h	65	69.6	77
Cruising time, min	62	57.5	52.4
Fuel consumption, G/KM/h	147.5	152.0	185.0
Length overall			27.6 m
Width overall.			6.7 m
Height while running			5.85 m
Height while standing.			4.68 m
Draft while standing.			2.28 m
Draft while running.			1.10 m
Length at waterline.			23 m
Beam of the hull			4.40 m
Displacement			29 brt
Capacity			8 dwt
Speed.			33 knc's
Range.			490 km

W-3 THE FIRST POLISH SPEED BOAT

Adam Bronikowski

During this years anniversary on the occassion of "Sea Days" over the water floated the first Polish speed boat, which at the beginning will serve between Szczecin and Swinoujście. In July of this year the River Shipyards at Danzig [Gdańsk] will most likely begin the construction of the next speed boat, which will serve harbors in the Danzig Gulf. As it appears we came out from the sea-boat dead-end and began undertakings in that direction. It will not be a thing away from the fact, to remind the readers about the beginning of the water carriers and about their first tests.

Ship constructors have already long come to a conviction, that all possible raises in the speed of floating units by giving a proper form to their hulls, appears to be already exhausted. Even the best specialists in this field - the Italians, maintain that for further progress is necessary to seek other dissolving ways. Among the new conceptions maximum successes have been so far attained by plans concerning speedy water boats.

The first speedy water boat was built in Germany in the year 1941, in the docks of Sachsenberg. It was a Navy trawler with a speed of 47.5 knots, which was later raised to 52 knots. In 1943 the very same shipyards built another speed boat with a displacement of 80 tons, and of greater radius of action, intended for rapid communication between Sicily and Northern Africa.

After the war tests with speedy boats were first undertaken by Italian constructors. In 1955 was constructed at the Messina shipyard the first speed boat of PT-20 type (length 21 m, width 8 m, 27 tons, speed 35 knots, range 325 km), then another speed boat PT-50 with a length of 28 m, width 6 m, 60 tons, speed 32/35 knots, driven by two 12-cylinder Mercedes-Benz engines of 1350 hp each.

One of the first countries which undertook the concept of constructing speedy boats was also the USSR. At construction offices were planned several interesting types of modern water boats, and the shipyard Krasnoye Sormovo in the city of Gorkiy began in 1957

a series production of same. These are among other water boats of the "Wolga" and "Molniya" type - small 2 to 6 people yachts, "Rakieta" river boat and its version the sea - "Kometa" taking on 55 passengers and developing a speed up to 45 knots. Next comes the "Mir" built in river version and sea version (92 passengers, speed 40 knots, range 400 km), "Meteor" in sea and river versions (length 34 m, speed 43 knots, 124 passengers) and the "Sputnik" - in river version (47 m long, 117 tons, 300 passengers, speed 40 knots). This boat is powered with four aviation engines of 1000 hp each. At the USSR is being built simultaneously a prototype of the ship for 150 passengers which will be driven by an AJ-20 engine (from the IL-18 aircraft) thanks to which the boat will be able to reach speeds up to 70 knots! The USA and the USSR are working simultaneously on the application of atomic drive for this type of units.

According to calculations carried out in the USSR such boats can within one time unit transport 2, 5-times more passengers or freight than a conventional ship. Italian experiences with the first 70 person boat PT-20, which within 5 years completed 11,000 hours of work having covered 590,000 km have shown, that operational and amortization expenditures are covered by the fair of 11 passengers during each trip (at 0.04 dollars per km).

But let us go back to our own boat, which is now undergoing final tests at the basins of the Danzig shipyards. Before it reached this point, work over the final version lasted for many months. The project was theoretically developed by scientists from the Gdansk Polytechnicum. Here at the Ship Theory Faculty under the direction of professor J. Kobyliński, were developed the basic foundations. And here they are.

The speed boat W-3 is provided with two hydrofoils of shallow submerged type in tandem arrangement, whereby the nose hydrofoil is partial, and the stern hydrofoil is completely submerged. The form of the hull was planned so as to obtain optimum starting characteristics, good floating qualities, carrier and buoyancy characteristics when floating at low speeds and a beautiful silhouette when floating at full speed.

Several words about the construction of the carrier hydrofoils. The hydrofoils as well as their supports were built from welded sheets of chromium nickel 1Kh18N9T, characterized not only by high endurance (mechanical endurance) but also by specific great resistance to corrosive effects of sea water. The construction of carriers hydrofoils at an overload coefficient of 1.92 assures a safety coefficient equalling to 2.34. The weight of the hydrofoils together with supports and helium is 2900 kgf, which places this type of construction in line of the best and lightest European constructions.

On the Polish speed boat the first attention goes to the engine. It is of Soviet construction, but it is assumed, that we will also build such engines here in Poland. It is a high pressure, high speed engine (1800 rpms) in the V arrangement. Small dimensions and good acquisitions place this engine of M-50 F4 type in line of the best driving units for speed boats.

The boat can take on 76 passengers, whereby one passenger cabin is on the stern, where 36 passengers can be accommodated and 40 passengers in the bow compartment. Rudder station, power station and crew cabin are interconnected. The rudder station is at a height of 1 meter above the bulkhead layer, the power station is under the steering section. The boat has assured nonsinking dual compartment, i.e., it is retained under full load in the water even when two individual sections are drawn.

And these are the remaining data of the W-3:

length	-	27.6	m
width	-	6.7	m
height when floating	-	5.85	m
maximum height at rest	-	4.68	m
immersion at rest	-	2.28	m
immersion during travel	-	1.10	m
water length	-	23	m
width of hall	-	4.40	m
revealment of hull	-	0.20	m
displacement	-	29	tons
carrying ability	-	8	DWT
speed	-	33	knots
range	-	490	km
weight (together with passengers)	-	29	tons

The first tests of the boat W-3 were executed at the Jeziorak Lake with model of 1:10. The technical project was executed by employees by the Faculty of Ship Theory at the Gdansk Polytechnicum and by engineers of the Construction Bureau of the Gdansk shipyards. The tests of the prototype are now being completed.

These are long lasting and as at each prototype very specific. In this case experiments were completed also and as result of sea specificity of this speed boat. The ordinances of Polish Ship register provide a very broad equipment even in a situation when the boat received a so-called experimental class. This hinders tests to a point, that the general foundations provide for the construction of a ship from best materials and with basic equipment. For this reason, the most important, without exaggeration, item in the hall, where the boat was built and equipped was the weight on which with almost drug store accuracy the elements were weighed.

Characteristics of Engine M-50 F4

Rotating speed of engine	rpm/min	1625	1700	1850
Speed	km/h	65	69.6	77
Time of covering route	min	62	57.5	52.4
Fuel consumption	G/KM/h	147.5	152.0	185.0

This is also connected with the nature of the tests, which must be conducted before the boat is handed over into exploitation. One of the important types of investigations are tensometric tests. These pertain to the state of strains in individual units of the boat which are mostly loaded. During these investigations is best proven by the fact, that in a relatively small boat were typed out 147 tensometric measurement points. Before the river shipyard began constructing the hull, were made a series of tensometric investigations pertaining to junction units. The results of these experiments, which showed a considerable deformation of jointed places brought the necessity of constructing a proper bow bed and then on the basis of that construction were carried out the welding jobs. It should be said, that especially during the welding of aluminum alloys, being the basic structural material of the boat, we do not have too much experience. The alloy DA-3 being in a semihard state changes during welding into soft state. In order that the material could return into previous structure the welded joints had to be riveted simply by a hammer.

To very interesting and complex examination tests belong also hydrodynamic tests. Here are corrected among others calculations of boat submersion at various loads, the optimum angles of attack of the carrier hydrofoils are determined at various speeds. The firsts tests have shown, that to attain better results it will be necessary to change the angle of attack by about 0.5° .

Other investigations will cover tests connected with the control buoyancy and turning of the ship at various speeds and at variable navigational conditions. Turning investigations of the boat are based among others on the description of the maximum angle at which the boat can execute a turn and will not sink when floating on the hydrofoils. These types of tests also cover turning when submerged, longitudinal buoyancy, establishing maximum carrying ability of the boat, as well as investigations on a rippled sea at various angles of attack of the wave (0° with wave, 180° against wave, 90° from side wave from left or right ship side and 45° and 135° slanting to the wave). The first tests were carried out with a boat under full load and they have shown, that the difficult exam went through well and that the prototype is successful. It is only necessary to desire that the sea marriage should not become the only most interesting event. It should be simply most massive.